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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 65: BANDED PINE WEEVIL

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Pest

BANDED PINE WEEVIL
Pissodes castaneus (De Geer)

Order: Family

Coleoptera: Curculionidae

Nomenclatural Note

This weevil is cited in most references as *Pissodes notatus* (Fabricius). However, *Curculio notatus* Fabricius 1787 is a junior homonym of *C. notatus* Bonsdorff 1785, and currently it is considered to be a synonym of *C. castaneus* De Geer 1775.

Economic Importance

This species is one of the most injurious pests of pine regrowth in the Soviet Union. It attacks mainly weakened, but viable trees, causing their death (Rozhkov 1970). In southern Yugoslavia, outbreaks occurred in 1957-58 and 1962-64, each time preceded by 1-2 dry years which weakened the trees (Karaman 1968).

One biological aspect of *P. castaneus* that makes it an especially dangerous potential immigrant is its preference for stems rather than leaders of otherwise healthy pine seedlings. This behavior is somewhat unusual among native American *Pissodes* species. *P. castaneus* probably would be seriously injurious to reforestation and timber plantings in North America.

The broad geographic distribution of *P. castaneus* indicates a wide range of climatic tolerance, increasing its potential to become an immigrant pest in North America. For instance, only one native *Pissodes* species (*nemorensis* Germar) is adapted to the southeastern United States as opposed to several native species in the Northeast. Therefore, there is considerable potential for immigration into the Southeast--either from southern Europe or from South America.

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Hosts

P. castaneus is associated principally with Pinus. The recorded hosts are Larix decidua (European larch), Picea abies (Norway spruce), Pinus halepensis (Aleppo pine), Pinus nigra (black pine), Pinus pinaster (maritime pine), Pinus pinea (Italian stone pine), Pinus strobus (eastern white pine), and Pinus sylvestris (Scotch pine) (Browne 1968, Carle 1971, Georgevits 1974, Lavrova 1967). In the Soviet Union, this species apparently infests young pine trees but rarely infests Larix sibirica (Siberian larch) (Rozhkov 1970).

Pissodes castaneus distribution map prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA

General Distribution

P. castaneus is found throughout Europe wherever there are suitable hosts. It is known from Madeira (von Dalla Torre et al. 1932), Azores (USNM specimen record), Algeria, and eastward into Siberia (Hoffmann 1954).

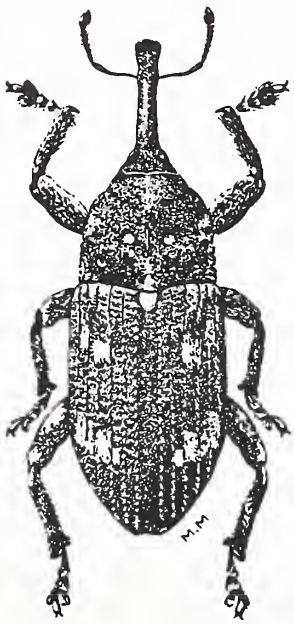
One important geographic fact is the establishment of P. castaneus as an immigrant to southern South America (Uruguay and adjacent parts of Argentina, confirmed by USNM specimen records). This immigration is of a warm-climate-adapted population. Such a population is capable of immigration to the southeastern United States from either southern Europe or South America. Uruguay represents the probable general area from which several South American weevil species (including three species of Graphognathus and two of Listroderes) have immigrated to North America.

A record from New York (von Dalla Torre et al. 1932) may be disregarded since it was based on an interception record (Felt 1910). We have no information that P. castaneus has ever become established in North America.

Characters

ADULT (Fig. 1) - P. castaneus is more easily distinguished from other Palearctic species than from some of the American species. A matured specimen of western Palearctic origin with the flanks of the pronotum largely concealed by large white scales is probably P. castaneus. If it also has the pronotum widest at the base and the strial punctures of the elytra nearly uniform in size, it is definitely this species.

(Fig. 1)



Pissodes castaneus adult, dorsal view (From Hoffmann 1954).

If all three of the above characters are clearly developed, the only North American species with which P. castaneus might be confused would be P. radiatae Hopkins (Monterey pine weevil) from the far western United States; P. radiatae differs by having much more strongly elevated elytral costae.

The principal problem in identification of P. castaneus is with the occasional specimen in which the pronotum is somewhat narrowed basally; such specimens closely resemble specimens of several American species, particularly those of the economically important P. strobi-nemorensis complex. If identification of a specimen is still in question, the following annotated diagnosis should be used.

Apex of elytral interval 5 (at tip of subapical callus or swelling) without evident, differentiated cluster of white or yellow scales (note: this pale patch is characteristic of P. dubius Randall and related taxa in North America, and of P. harcyniae Herbst and P. piniphilus Herbst in Europe); hind femur at subapical swelling (near apical 1/4) with clearly evident patch or ring of enlarged pale scales (note: this subapical annulus is not evident in the North American P. fasciatus LeConte nor in an unidentified Mexican species); sides of body (flanks of both pronotum and metasternum) with large, round or ovate, white or creamy scales densely and rather regularly distributed (note: in other Palearctic species and in some North American species these scales may be small, or dark, or lanceolate, or clustered into conspicuous patches); elytral striae, particularly striae 1-6, with punctures nearly uniform and of moderate size (note: in the European P. piceae (Illiger) and in some American species the striae have a mixture of small and grossly enlarged punctures; all such species also differ in one or more of the other characters given above); intervals 3 and 5 "costate," feebly but distinctly more elevated than interval 4 (note: the elytral costae are much more prominently elevated in the otherwise difficult to distinguish western American P. radiatae (Hopkins); hind tibia without a large ventral brush of long setae (note: this tibial brush is an extremely conspicuous character of males of the American P. affinis Randall); across intervals 4 and 6, posterior elytral spot or band (Fig. 1) placed clearly behind middle (note: the posterior elytral spot is placed clearly over the middle in some American species), and in most but not all specimens this spot or band is distinctly bicolored (partly white, partly yellow to orange); pronotum not strongly rounded or narrowed at base, in most specimens widest at base or nearly so and with hind angles sharply or even acutely produced (note: this character

distinguishes most specimens of P. castaneus from most specimens of North American species except P. radiatae, and from other European species except P. piceae); elytral humeri angulate to narrowly rounded (Fig. 1) (note: except for P. radiatae, most species in North America and Central America tend to have broadly rather than abruptly rounded humeri, but this character is too subtle and variable to be clearly diagnostic).

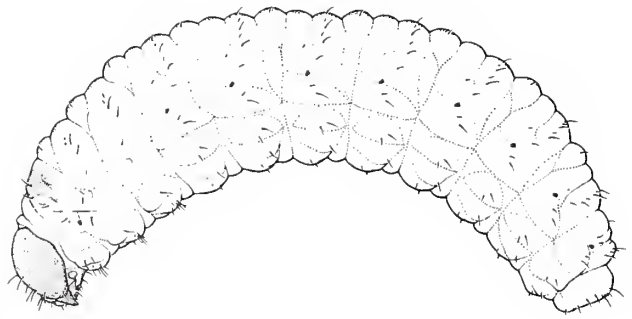
EGGS - No descriptions or figures of eggs of P. castaneus are available, but descriptions of eggs of other Pissodes species (Hopkins 1911, Martin 1964, Stevens 1966, Stevenson 1967) indicate that they are ovoid, equally rounded at both ends, smooth, shiny, translucent white, with a thin, fragile chorion, and measure about 0.6-1.0 X 0.4-0.6 mm. The egg of P. strobi (Peck), formerly P. engelmanni Hopkins (Engelmann spruce weevil), is figured as an example (Fig. 2).

(Fig. 2)

Pissodes strobi egg deposited in oviposition puncture (From Stevenson 1967).

LARVAE (Figs. 3-9) - Mature larvae of P. castaneus measure 8.0-10.0 mm in length (Scherf 1964). The larva has been described, figured (as notatus), and distinguished in keys from those of other European species (Kangas 1935, Scherf 1964, and Viedma 1963), but there is no information to separate it from larvae of North American species of Pissodes. Larvae of

(Figs. 3-9)



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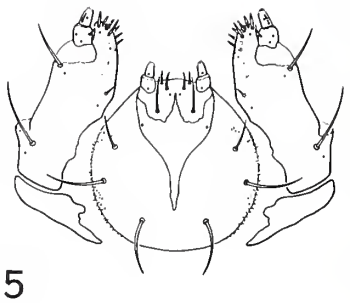

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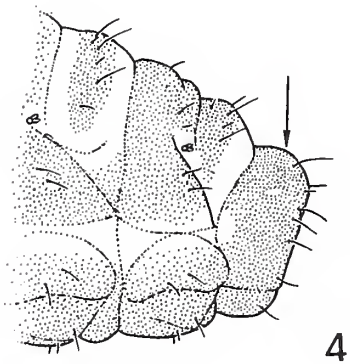

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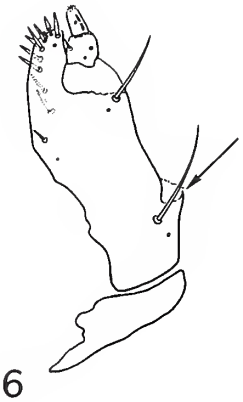

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Larvae: 3-6. Pissodes castaneus. 3. Mature larva, lateral view. 4. Lateral view of terminal end of abdomen, showing distinctive terminal segment (arrow). 5. Labium and maxillae, ventral view. 6. Maxilla, ventral view showing marginal lobe (arrow). (Figs. 3-6 drawn by T. B. Griswold). 7-9. Abdominal spiracle. 7. Hylobius congener. 8. Pissodes approximatus. 9. Pissodes affinis (From Thomas 1964).

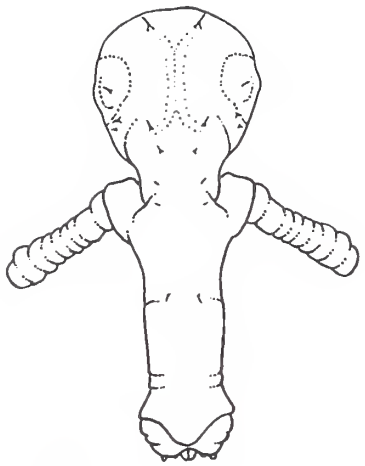
Pissodes differ from those of other genera of Curculionidae and Scolytidae found under bark of pine in the following features. As in other weevils and in the bark beetles, the larva (Fig. 3) is legless, C-shaped, and white, except for the pigmentation of the head and pronotal sclerites; but unlike the other genera the terminal abdominal segment (Fig. 4) is subcylindrical without distinct lateral (pleural or epipleural) folds, giving it the appearance of a rounded cushion covered with fine dark asperities and a few setae. The labium and maxillae (Fig. 5) are similar to those of the other larvae mentioned, but the outer margin of the basal third of the maxilla bears a distinct toothlike lobe (Fig. 6) versus a simple, curved margin. The spiracles bear 2 annulated marginal air tubes and may be bordered dorsally by a dark crescent-shaped sclerite, but they are not surrounded by a dark ring as in Hylobius larvae (Figs. 7-9). Further comparison of the figures of P. castaneus larvae and suspect Pissodes larvae, with careful regard to the number, arrangement, and relative length of setae on all parts figured, may be helpful. A detailed technical description of Pissodes larvae by Anderson (1947) is the best literature source for identifying larvae to genus, but dissection and slide-mounting of the specimens are required to see the necessary characters.

PUPAE - Pupae of P. castaneus are described as white and 4.5-7.0 mm long (Scherf 1964). Except for some brief notes by Kangas (1935), no detailed description or key to separate the pupa of this species from those of any other Pissodes species has been published. Therefore, it would not be possible to distinguish pupae of P. castaneus from those of North American species. Suspected pupae of P. castaneus should be compared with Figures 10-12 with careful attention to the setae, their number and pattern, on tubercles or not, etc., in addition to the size, shape, and proportions of the pupa. According to Thomas (1964), the major setae of Pissodes pupae differ from those of other weevil genera infesting pine in having a rough surface (Fig. 13) versus a smooth surface (Fig. 14). This distinctive feature is present in P. castaneus pupae.

Characteristic Damage

Pine trees become stunted and parts of the trunks desiccated with persistent infestation, providing favorable conditions for further attack by P. castaneus (Karaman 1963). Damage (Fig. 15) to pine is characterized by fine punctures on the stem, swellings on bark from developing larvae and pupae, and exit holes made by emerging adults (U.S. Department of Agriculture 1958).

(Figs. 10-14)



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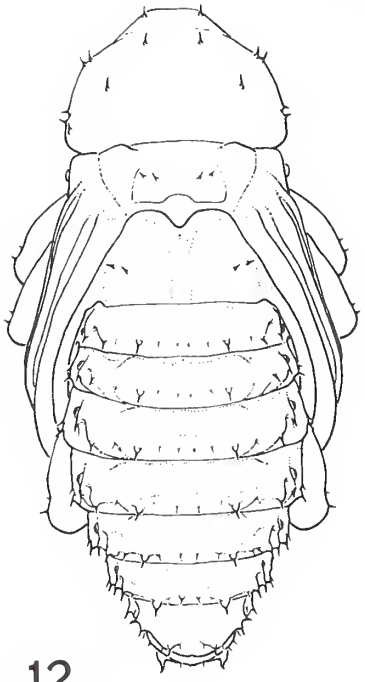

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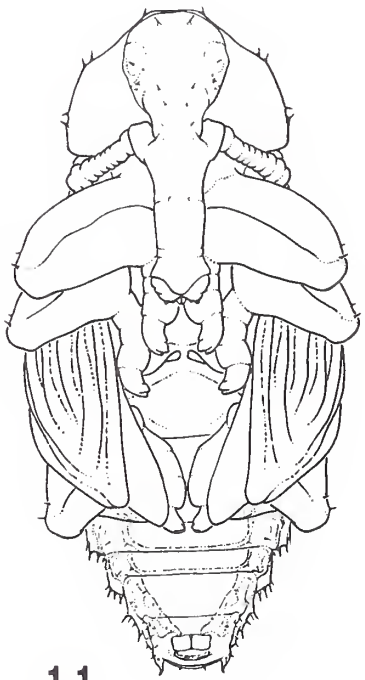

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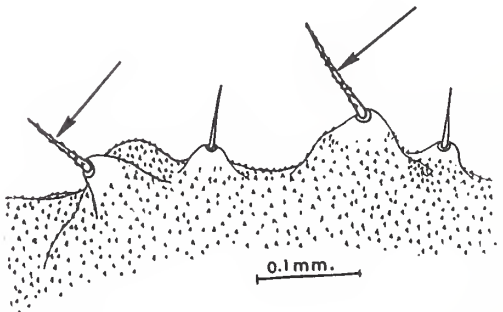

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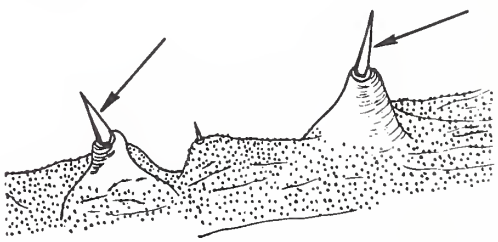

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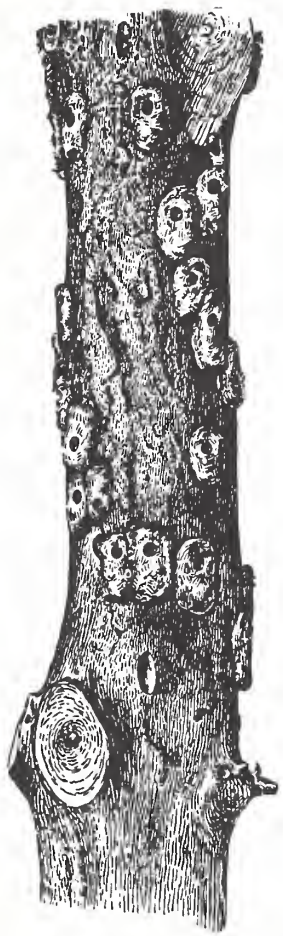
0.1mm.

Pupae: 10-12. Pissodes castaneus pupae. 10. Front view of head. 11. Ventral view. 12. Dorsal view (Figs. 10-12 drawn by T. B. Griswold). 13. Pissodes affinis, rough-surfaced setae (arrows) on second abdominal tergum. 14. Smooth-surfaced setae (arrows) on second abdominal tergum (From Thomas 1964).

(Fig. 15)



Characteristic damage by Pissodes castaneus (From Boas 1923).

Detection Notes

The movement of this pest from country to country may occur in one of several ways. Possible pathways are the international movement of lumber, logs, dunnage, and wood used as bracings or crating with cargo. Such wood products are enterable into the United States subject to inspection under Title 7, Part 330.105 of the Code of Federal Regulations.

P. castaneus has been intercepted at U.S. ports of entry 31 times in the past 13 years from Belgium, Italy, Poland, Portugal, Spain, and West Germany.

Based on specimen records in the USNM, P. castaneus is the exotic Pissodes species most frequently intercepted. The only other European species represented by such interception records

is P. pini (Linnaeus). Two Japanese species also are represented. However, the supposed place of origin of specimens found in crating or similar materials should be considered uncertain. For example, one specimen of supposed German origin is the American P. strobi (Peck); its place of origin, therefore, may have been incorrectly identified.

To detect possible successful immigrants, particular attention should be given to any unusual Pissodes infestations, especially in young pine plantations.

Certain American Pissodes species are so closely related to one another that even sympatric taxa such as P. strobi (Peck) and P. approximatus Hopkins (northern pine weevil) are known to be completely interfertile yet maintain their separate identities. Although perhaps unlikely, if P. castaneus were interfertile with any American species, such native species might acquire economically undesirable biological characteristics via hybridization. This is another reason to pay particularly close attention to any peculiar or unusual Pissodes outbreak that might occur in North America.

Adult specimens are needed for accurate identification to species. Since adult specimens intercepted at ports of entry frequently are teneral and shrivel when dried, they should be preserved in 75 percent ethyl alcohol along with larval and pupal specimens. Field-collected adult specimens should be submitted in series, point mounted.

Biology

Studies in 1962-63 in the Soviet Union showed that Pissodes castaneus produced one generation a year and that the egg, larval, and pupal stages averaged 8 (range 7-9), 48 (35-61), and 15 (13-17) days, respectively. Most adults emerging in summer and fall overwintered as sexually mature adults. In early spring, many of these females oviposited after brief feeding and mating. Oviposition lasted 2 months. The females died soon after. The few that hibernated again did not survive (Bukzeeva 1965).

In the United Kingdom, P. castaneus completes its life cycle in 2 years. After a period of feeding and mating, the overwintered females bore small holes to deposit their eggs. The eggs may be laid singly or in small batches at any point on the stem, including the current year's leader of the tree; areas close to the whorls of branches are particularly favored (Forestry Commission 1952). In the Soviet Union, the females deposit

1-5 eggs in an egg cell in the bark of 3 to 20-year-old pine trees (Rozhkov 1970). Egg laying on small trees may extend from the leader down to ground level.

Larvae that hatch from eggs laid in the bark on the thicker part of the stem, bore long feeding tunnels between the bark and the wood, packing the boring meal tightly behind them.

On completing its development, each larva excavates a pupal cell in the surface of the wood and covers the cell with shredded wood fiber. When eggs are laid in the bark of shoots of the current year, the young larva penetrates instead to the pith where it proceeds to feed and develop, finally excavating a cavity in the wood to form a pupal chamber, partly in the wood and partly in the pith. The chamber is usually at an angle of about 45 degrees to the main axis of the stem, but does not penetrate the bark, which is left intact to form an outer cover; in such cases no covering is formed of shredded wood fiber, although a thin layer of wood may be left intact.

The larvae normally complete their development by the following spring and pupate. Young adults gnaw their way through the bark, each making a round exit hole. On emergence, the adults feed on the bark of pines and other coniferous trees during the summer and fall before hibernation (Forestry Commission 1952).

In laboratory studies in France, the adults remained beneath the bark for about 1 week until pigmentation was completed, and then they bored exit holes. The period from egg to adult development lasted at least 62 days at 22-24° C, and at least 55 days at a constant temperature of about 25° C. In the laboratory at 22-23° C and 60-70 percent relative humidity, the adults had to feed on new pine shoots for 13 days before becoming sexually mature and mating; if only logs were available, pairing was delayed still further. The female lived for 250 days and mated several times, although oviposition began shortly after the first mating (Carle 1967).

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